

# Thomas Bury

## Curriculum Vitae

Department of Applied Mathematics  
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### Education

- 2015-2019 **PhD, Applied Mathematics, The University of Waterloo.**  
Thesis title : Using stochasticity to detect and distinguish tipping points in complex systems.  
GPA : 96.4%  
Advisors : Prof Chris Bauch, Prof Madhur Anand
- 2011-2015 **BA, MMATH, Mathematics, Queens' College, The University of Cambridge.**  
First class honours. Courses included theoretical and biological physics.

### Research Positions

- 2015-current **Doctoral Candidate, The University of Waterloo.**  
Funded 4-year research post at the Dept. of Applied Mathematics to conduct research on early warning signals for tipping points in complex systems.
- 2017-2018 **Senate Graduate and Research Council, The University of Waterloo.**  
Math grad student representative for matters of academic quality and research activity within the university.
- 2014 Jun-Aug **DAMTP Research Placement, The University of Cambridge.**  
Funded summer research post at the Dept. of Applied Mathematics and Theoretical Physics to analyse the spatio-temporal dynamics of the 2009 UK Influenza outbreak.

### Invited Talks

- August 2018 ESA Annual Meeting 2018, 'Early warning indicators of ecological tipping points: do they predict critical transitions in multi-stable systems, or something else?'.

### Contributed Talks

- June 2019 CAIMS Annual meeting, Whistler, 'Detecting and distinguishing tipping points using spectral early warning signals'.
- May 2018 WICI, Leveraging systems approaches to improve human & planetary health, 'Workshop: A Hands-On Introduction to Mathematical Modelling'.
- Jan 2018 Centre for Teaching Excellence, University of Waterloo, 'Breaking the Norm: Cooperative Learning in the Undergraduate Math Classroom'.
- Jan 2018 Dynamics Days U.S., 'Characterising impending transitions in complex systems'.
- Nov 2017 GRADTalks, University of Waterloo, 'Tipping Points and the Role of Mathematics'.
- Sept 2017 TEDx, University of Toronto, 'Tipping Points and the Role of Mathematics'.
- Aug 2017 AMMCS International Conference, 'Anticipating critical transitions in socio-ecological systems'.
- Jul 2017 Mathematical Models in Ecology and Evolution Conference, City University of London, 'Regime shifts in socio-ecological systems : silent early warning signals in the natural subsystem'.

May 2017 WICI, Resilience in Complex Natural and Human Systems, University of Waterloo, 'Early warning signals in socio-ecological systems'.

## Publications

### Journal articles (peer review)

- P1 T. M. Bury, C. T. Bauch, and M. Anand. Charting pathways to climate change mitigation in a coupled socio-climate model. *PLOS Computational Biology*, 2019.
- P2 T. M. Bury, C. T. Bauch, and M. Anand. Detecting and distinguishing using spectral early warning signals. *Nature (in submission)*, 2019.
- P3 A. D. Pananos, T. M. Bury, C. Wang, J. Schonfeld, S. P. Mohanty, B. Nyhan, M. Salathé, and C. T. Bauch. Critical dynamics in population vaccinating behavior. *Proceedings of the National Academy of Sciences*, 2017.

### National and international media coverage

My lead-author publications have featured in media outlets such as CityNews (Toronto), The Global and Mail (Canada), The National Post (Canada), The Business Standard (India), Bohemia (Cuba) and Greenreport (Italy).

## Software

- S1 T. M. Bury, ewstools, <https://github.com/ThomasMBury/ewstools>.  
A Python package for computing, analysing and visualising early warning signals in time-series data. Includes spectral early warning signals, a novel approach to distinguishing, as well as detecting bifurcations.

## Awards and Grants

- May 2019 Travel grant for CAIMS annual meeting. (\$500) *WICI*
- Jan 2018 Travel grant for ESA annual meeting. (\$1000) *WICI*
- Jan 2018 Travel grant for conference 'Dynamics Days U.S.' (\$1000) *WICI*
- Nov 2017 GradTalks research dissemination award (\$500). *University of Waterloo*
- Apr 2017 Public speaking award (\$300). *Fields Thesis Competition*
- Feb 2017 Faculty level winner. *Three-Minute-Thesis competition*
- Jul 2016 Foundation Scholarship. *Queens' College, University of Cambridge*

## Teaching

### Certifications

- Jan 2019 **Certificate of University Teaching**, *University of Waterloo*.  
A two-year, in depth, selective teaching course for PhD students. Includes multiple teaching observations, guided self-reflection and improvement, workshops and a pedagogical research project. Teaching dossier available on request.
- Aug 2016 **Fundamentals of University Teaching**, *University of Waterloo*.  
Pre-requisite to the former. Involves weekly workshops and 'microteaching' assessments.

### Select teaching appointments

- Fall 2018 **Course Instructor**, *University of Waterloo*.
- Course : Calculus I for the Sciences, 115 students, 1 teaching assistant
  - Contribution: Designed and implemented lectures three times a week, contributed to exam and project development, manager of teaching assistant and tutorial sessions.
  - Student evaluations: Very strong (>4.5/5 average for each teaching aspect)

Fall 2016 **Lead Teaching Assistant**, *University of Waterloo*.

- Course : Calculus I for Engineers, 667 students, 11 teaching assistants
- Contribution: designed weekly problem sheets with solutions for the course, ran interactive tutorial sessions, held office hours, marked and proctored exams

Winter 2018 **Teaching Assistant**, *University of Waterloo*.

- Course : Stochastic processes in the physical sciences, 15-20 graduate students, 1 teaching assistant
- Contribution: gave guest lectures on specialist topics, provided sample code with live demonstrations, extended course notes, marked assignments

## Volunteering

2016-current Let's Talk Science: A national, charitable organisation focused on outreach of STEM subjects to schools across Canada. Active volunteer.

Mar 2017 Centennial Public School, Waterloo: Science fair judge

Dec 2016 STC Physics Lab Day, University of Waterloo: Facilitator

Jul 2014 Millennium Mathematics Project, University of Cambridge: Volunteer at mathematical epidemiology workshop for schools.

## Memberships

Deep learning in the Information Lab - University of Waterloo

Society for Industrial and Applied Mathematics

Waterloo Institute for Complexity and Innovation

Institute of Mathematics and its Applications

## Programming skills

Python, Mathematica, Matlab

C, R

*strong  
competent*

## Languages

English

French

*native  
conversational / B2*

## References

**Prof. Chris Bauch (PhD co-advisor)**

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**Prof. Madhur Anand (PhD co-advisor)**

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